O-37
The effect of combined anaesthesia with epidural postoperative analgesia on splanchnic perfusion in patients undergoing abdominal aortic aneurysm repair

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Introduction. Patients undergoing major surgery are at risk of developing gut ischaemia and multiple organ failure. The effects of epidural anaesthesia on regional splanchnic blood flow is not well known. The aim of this study was to investigate the effects of combined anaesthesia with epidural postoperative analgesia on splanchic perfusion.

Method. Twenty-one patients undergoing abdominal aortic aneurysm repair were randomized in two groups, a combined (epidural-general) anaesthesia group (EAG n=14) with epidural postoperative analgesia and a control group (COG n=7), general anaesthesia with intravenous postoperative analgesia. After induction of anaesthesia a sigmoid and a gastric tonometer were placed for the measurement of sigmoid and gastric intra-
mucosal CO2 levels (PCO2: sigmoid and PCO2: gastric), the regional-arterial CO2 difference (PrPa sigmoid and PrPa gastric) and the intramucosal pH. Additional measurements included mean arterial pressure (MAP), cardiac output (CO), systemic vascular resistance (SVR) and arterial lactate levels. All measurements were performed at predetermined time points: after induction of anaesthesia (T0), before aortic clamping (T1), 20 minutes after clamping (T2), 10 minutes after declamping (T3), before tracheal extubation (T4), 2 (T5), 6 (T6),12 (T7) and 24 hours postoperatively (T8).

Results. There were no significant intra- and intergroup differences for MAP, CO, SVR. Arterial lactate levels increased in both groups at T1, T2, T3, T4, T5. There were no significant intergroup differences for gastric tonometric values. Sigmoid pH decreased in both groups at T1, T2, T3 with a significant difference between the groups at T1. PrPa sigmoid decreased in both groups at T1, T2 with a significant difference between the groups. pgCO2 sigmoid increased in both groups at T1, T2 and this increase was significantly more in COG.

Conclusion. Combined anaesthesia with postoperative epidural analgesia may improve intestinal perfusion.

Reference.

O-38
The effect of continuous negative external cuirass ventilation on arterial blood gas measurements in volunteers

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Introduction. Negatively applied pressure ventilation to the thorax and abdomen in intubated patients following cardiac surgery using the RTX ventilator® has favourably altered arterial blood gas measurements [1]. Effects on arterial blood gases of various modes of negative pressure ventilation in healthy volunteers are unknown. With full ethical and institutional approval we investigated the hypothesis that the use of the RTX ventilator® in continuous negative and control modes will lead to improved oxygenation in healthy volunteers breathing room air.

Method. Ten volunteers had continuous radial artery pressure monitoring. Five were active smokers and 5 lifelong non-smokers. Arterial blood gas samples were obtained before the end of 5 experimental modalities each lasting 5 minutes: (1) baseline; (2) continuous negative of -20 cm H2O; (3) first rest period; (4) control mode of 12 breaths/min at -20 cm H2O; (5) second rest period.

Results. Control mode improved oxygenation and reduced PCO2 compared with the preceding and ensuing rest periods (see Table 1). These changes were more marked in smokers.

<table>
<thead>
<tr>
<th>Time</th>
<th>Baseline</th>
<th>Continuous negative</th>
<th>Rest 1</th>
<th>Control Mode</th>
<th>Rest 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH</td>
<td>7.43±0.01</td>
<td>7.43±0.01</td>
<td>7.42±0.01</td>
<td>7.48±0.01</td>
<td>7.43±0.01</td>
</tr>
<tr>
<td>PO2</td>
<td>13.7±0.098</td>
<td>13.02±0.94</td>
<td>12.04±1.24</td>
<td>14.22±1.5</td>
<td>11.76±2.04</td>
</tr>
<tr>
<td>PCO2</td>
<td>4.7±0.42</td>
<td>4.76±0.51</td>
<td>4.9±0.42</td>
<td>3.8±0.61</td>
<td>4.7±0.61</td>
</tr>
<tr>
<td>Base excess</td>
<td>-0.55±1.38</td>
<td>-0.29±1.3</td>
<td>-0.2±1.2</td>
<td>0.03±1.29</td>
<td>-0.05±1.41</td>
</tr>
</tbody>
</table>

Table 1. The table shows arterial blood gas variables (mean ± standard deviation) at each experimental modality for 10 subjects. Repeated measures analysis of variance was used to compare sampling times with (1) baseline (**P<0.05; ***P<0.01; ****P<0.001); (2) continuous negative (^^^P<0.001); (3) rest 1 (***P<0.01; ****P<0.001) and (4) control mode (**P<0.01; ***P<0.001).

Conclusion. The use of the external cuirass ventilation in control mode in healthy subjects leads to improved oxygenation.

Reference.
O-39
The haemodynamic effects of continuous negative external cuirass ventilation in volunteers

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Introduction. Negatively applied ventilatory pressure to the thorax and abdomen in intubated patients following cardiac surgery using the RTX ventilator has favourably altered haemodynamic parameters using invasive pulmonary artery catheter (PAC) based cardiac output (CO) monitoring. The haemodynamic effects of various modes of negative pressure ventilation in healthy volunteers is unknown due to the problem of invasive monitoring. Recently the MOSTCARE PRAM system has allowed continuous monitoring of CO, cardiac index (CI), pulse pressure variation (PPV) and stroke volume variation (SVV) and cardiac cycle efficiency (CCE) from a single radial arterial artery signal. We investigated the hypothesis that use of the RTX ventilator in continuous negative and control modes will lead to improved venous return with consequent reduction in SVV, PPV, HR (heart rate) with an increase in CCE and CO.

Method. Ten volunteers had continuous radial artery pressure monitoring with PRAM analysis allowing continuous recording of SVV, PPV, CCE and CI. Haemodynamic measurements over one minute were taken before the end of 5 experimental modalities, each lasting 5 minutes: (1) baseline; (2) continuous negative of -20 cmH2O; (3) rest period; (4) control mode of 12 breaths/min at -20 cmH2O; (5) rest period.

Results. Continuous negative mode led to significant falls in SVV and PPV and HR. Although HR was reduced in control mode, the falls in SVV and PPV were not quite significant. CCE was not altered in healthy subjects.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Baseline</th>
<th>Continuous negative</th>
<th>Rest 1</th>
<th>Control Mode</th>
<th>Rest 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>HR</td>
<td>71.5±8.5</td>
<td>63.5±6.7***</td>
<td>65.1±6.6**</td>
<td>68.7±8.10*</td>
<td></td>
</tr>
<tr>
<td>CO</td>
<td>6.1±1.5</td>
<td>6.2±1.4</td>
<td>5.8±1.37</td>
<td>5.7±1.22</td>
<td>5.7±1.04</td>
</tr>
<tr>
<td>SVV</td>
<td>18.6±4.1</td>
<td>12.2±3.99**</td>
<td>14.9±5.47</td>
<td>14.8±5.68</td>
<td>15.5±4.5</td>
</tr>
<tr>
<td>PPV</td>
<td>21.7±8.68</td>
<td>11.4±5.7*</td>
<td>17.0±7.1</td>
<td>14.1±8.61</td>
<td>14.3±6.3</td>
</tr>
<tr>
<td>CCE</td>
<td>0.32±0.17</td>
<td>0.45±0.08</td>
<td>0.41±0.06</td>
<td>0.36±0.2</td>
<td>0.22±0.21</td>
</tr>
</tbody>
</table>

Table 1. The table shows the haemodynamic variables at each experimental modality. Repeated measures ANOVA was used to identify significant differences from baseline (**P<0.05; ***P<0.001).”

Discussion. A fall in SVV and PPV and HR may suggest improved venous return as a result of the negative intrathoracic pressure. In spontaneously breathing, extubated subjects this device improves haemodynamics.

Reference.

O-40
Use of the RTX cuirass ventilator® improves cardiac cycle efficiency in extubated cardiac surgery patients

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Introduction. Cardiac Cycle Efficiency (CCE) can be obtained by the MOSTCARE® monitor, a pulse contour analysis device using the pressure recording analytical method (PRAM). CCE represents the relationship between the power developed from the heart and that dissipated within the cardiovascular system (ventricular-arterial coupling), where +1 represents the best possible ventricular function and -1 the worst. CCE correlates with pro-B type natriuretic peptide in cardiac surgery patients suggesting its usefulness in monitoring myocardial failure [1]. External negatively applied ventilation through the RTX cuirass ventilator®, improves haemodynamics in intubated cardiac surgery patients [2]. It is unknown if such ventilation improves CCE in postoperative extubated cardiac surgery patients.

Method. Six patients had continuous arterial pressure monitoring with MOSTCARE®, allowing continuous recording of CCE. CCE measurements over one minute were taken before the end of the 5 experimental modalities each lasting 5 minutes: (1) baseline; (2) mode 1: continuous negative of -20 cm H2O; (3) first rest period; (4) mode 2: control mode of 12 breaths/min at -20 cm H2O; (5) second rest period.

Results. CCE was significantly improved in modes 1 and 2 (See Diagram 1). The patients tolerated the cuirass without difficulty.

Diagram 1. CCE changes throughout the study. Repeated measures ANOVA identified differences from baseline (*P<0.05; **P<0.01; ***P<0.001).

Conclusion. Negative pressure ventilation improves CCE in extubated cardiac surgery patients and may be helpful following cardiac surgery.

References.